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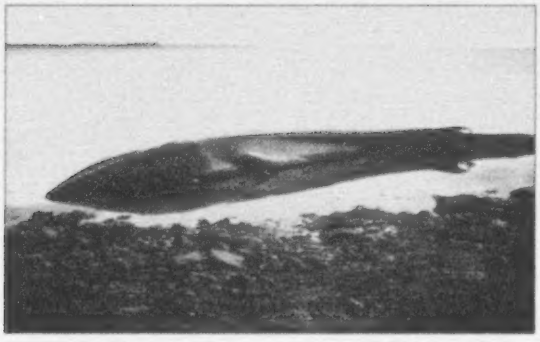
EUTHANASIA TECHNIQUES FOR SMALL AND LARGE CETACEANS



Emaciated live young fin whale (Source: Canadian Veterinary Journal 42:127-129, 2001, reproduced with permission)

Figure 1. Department of Fisheries and Oceans' (DFO) six administrative regions.

Context:

Fisheries and Oceans Canada (DFO) is responsible for the protection, conservation and management of marine mammals. There are occasions when the euthanasia of a small or large cetacean is the only option that DFO can take in dealing with severely injured or sick animals that have no chance of survival. In cases where it is determined that nothing else can be done for such an animal, DFO needs to have a consistent approach and statement on that approach that is backed by Science. The Department currently has no national guidelines concerning the euthanasia of cetaceans. There is therefore a need for advice with regard to when and how such situations should be handled.

Without advice to build guidelines on proper methods of euthanasia for different species, there is a risk that the method chosen to euthanize an animal will exacerbate the pain and suffering sustained by individual animals.

This Science Advisory Report is from the "Euthanasia Techniques for Cetaceans" peer-review and teleconferences held on June 23 and 26, 2014. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

SUMMARY

- Several circumstances may require the euthanasia of a cetacean: stranding, entanglement in fishing gear, entrapment in ice, significant injury of a free-swimming cetacean from ship-strike, or a terminally ill animal in a captive situation. However, the most common situation is the presence of a severely debilitated, ill, or injured cetacean that has stranded in shallow water or on shore.
- Although the means to accomplish euthanasia of cetaceans can be difficult, the clear intention is to prevent suffering as much as possible. Best practices include the following

basic elements (in accordance with the guidelines of the Canadian Council on Animal Care, CCAC 2010) for an animal in a terminal state of disease or injury, or which has no hope of survival (e.g. dependent young animal that has lost its mother);

a) the animal must be treated in a respectful, humane manner at all times;
b) loss of consciousness must be achieved prior to any significant noxious procedure;
c) a certain, humane, death must be achieved and confirmed

- Prior to euthanasia, cetaceans must be given a proper physical examination (to the degree possible) by a veterinarian or biologist familiar with cetacean anatomy and physiology in order to assess the situation and pursue the appropriate course of action.
- Specific euthanasia techniques for small cetaceans (best practices in decreasing order of preference) are as follows:

  a) One animal: deep sedation by intramuscular injection followed by euthanasia by:

     1. intravenous injection of a euthanasia drug; or
     2. intracardiac injection of a euthanasia drug; or
     3. gunshot to the brain.

  b) Small number of animals: all animals to be euthanized should first be sedated by intramuscular injection, then euthanized by:

     1. intravenous injection of a euthanasia drug; or
     2. intracardiac injection of a euthanasia drug; or
     3. simultaneous gunshot to the brain of as many of the selected animals as possible, and the rest in rapid sequence.

  c) Large number of animals: do nothing until careful planning has been completed, which has as its purpose the selection of those animals requiring euthanasia and the most rapid simultaneous euthanasia of as many of these animals as possible in the shortest possible time. Considering the difficulty of finding large amounts of the appropriate drugs on short notice, the best options in decreasing order of preference are:

     1. simultaneous gunshot to the brain of as many of the selected animals as possible, and the rest in rapid sequence; confirm that death has occurred for each animal after all have been shot once; reshoot any animal not dead from the first shot; or
     2. intravenous injection of a euthanasia drug; or
     3. intracardiac injection of a euthanasia drug; or
     4. protected natural death with palliative care for those animals which may not be reached in time for euthanasia.

- Specific euthanasia techniques for large cetaceans (best practices in decreasing order of preference), are as follows:

  a) On shore: deep sedation by intramuscular injection followed by euthanasia by:

     1. intracardiac injection of a euthanasia drug or KCl or both; or
     2. explosives; or
     3. protected natural death with palliative care

  b) In water: deep sedation by intramuscular injection followed by protected natural death with palliative care.

- Responders should use a combination of accepted criteria to confirm loss of consciousness and death of a cetacean, regardless of its size.
- Methods of carcass disposal considered should mediate the risk of environmental contamination (e.g. chemical drug residues, lead from ballistics) to the environment, other wildlife, and humans, especially in relation to northern communities where cetacean meat is commonly used for human consumption or dog food.

BACKGROUND

The presence of a severely debilitated, ill, or injured cetacean stranded in shallow water or on shore represents the most common situation requiring euthanasia. From an animal welfare perspective, this constitutes an emergency, but it is also a challenge to even the most prepared responders as all stranding events differ from each other in at least some respects.

Veterinary science has much to say about the techniques and emotional and societal elements of animal euthanasia, and is highly informed in this regard with respect to most terrestrial species. Ensuring the successful euthanasia of a cetacean represents a different challenge. There is a need to increase our ability to provide a "good death" for cetaceans on short notice, in different locations, and under environmental conditions that are often difficult. Daoust and Ortenburger (2015) seeks to fulfill some of that need, based on current knowledge.

These guidelines will help in the decision making process regarding euthanasia of whales, dolphins, and porpoises (i.e. cetaceans), specifically identifying options regarding when and how euthanasia should be performed for small and large cetaceans, including who should perform what tasks. Although the conservation status of a particular species may influence efforts invested in trying to rescue an animal in distress, the welfare of the individual animal affected must take priority, especially when efforts at rescuing it will only prolong its suffering when chances of survival are minimal. However, if a cetacean is listed under the *Species at Risk Act* (SARA), related legal obligations must be respected.

DFO's Ecosystems and Fisheries Management requested advice from Science to develop these guidelines. The Research Document, Daoust and Ortenburger (2015), is intended to provide technical information to wildlife responders for the purposes described above. The present report is intended to provide a general outline of the context, approach used and conclusions of the supporting Research Document (Daoust and Ortenburger 2015). However, Daoust and Ortenburger's (2015) document contains all of the technical information to assist responders in making appropriate decisions regarding cetacean euthanasia.

ANALYSIS

Daoust and Ortenburger (2015) review the special circumstances, problems, and current techniques associated with euthanasia of cetaceans, with emphasis on species found in Canadian waters. Their purpose is to provide easily retrievable information that will allow responders to deal promptly and efficiently with cetaceans in distress in the event that euthanasia is the chosen course of action.

General considerations are first described. Cetacean stranding events are often witnessed by the public, and therefore public expectations must be addressed, but without jeopardizing the welfare of the animals. The decision process to deal with stranding events should be as structured as possible and take into account all local conditions at the time, the species and number of animals involved (including the potential need for triage, based on clinical assessment of individual animals), and the expertise and equipment available.

There are two primary methods of euthanasia available for cetaceans, the use of which is greatly influenced by the size of the animal and the expertise, equipment and material available. Physical methods include ballistics (rifles) for small cetaceans and explosives for large cetaceans. The use of ballistics, particularly calibre of ammunition and type of projectile (bullet), must take into consideration the size of the animal and its anatomy, especially as it relates to external landmarks on the head that will allow immediate destruction of the brain by the projectile. Chemical methods involve the use of a broad variety of drugs, not only for euthanasia, but also, ideally, for sedation prior to euthanasia. Use of these chemical methods also implies a good knowledge of the appropriate doses of drugs to be used and of the anatomical sites for injection.

Allowing the cetacean to die on its own, without harassment by people or animals, referred to as "protected natural death with palliative care", must be considered a valid option when euthanasia cannot be performed humanely, either because of the large size of the cetacean, local conditions (e.g., heavy surf) or because appropriate resources are not available. This option should be seen as representing a carefully considered and deliberate choice to provide for the best possible death for the cetacean as permitted by the circumstances, and not a passive act which implies simply walking away from the dying cetacean.

Confirmation of death constitutes the next crucial step in the euthanasia procedure. Although this can be a challenging step to perform in a large cetacean, a set of accepted criteria (e.g., loss of corneal reflex, fixed and dilated pupils) is available which should be used to ascertain that death has been achieved.

Successful completion of euthanasia does not represent the end of the responders' responsibilities, as carcasses must be disposed of in an environmentally suitable manner. This is particularly important if a chemical method of euthanasia has been used, as drug residues in the carcass represent a potential source of environmental contamination. In addition, the value of performing a necropsy on these carcasses cannot be emphasized enough as it maximizes the information obtained about the species involved, including possible causes of stranding and the potential presence of emerging infectious diseases.

Recommendations for cetacean euthanasia in Canada

For the specific euthanasia protocols listed in Table 6 of Daoust and Ortenburger 2015 (see Appendix A), the first principle must be: "...when expertise and necessary equipment are available." The methods for each set of circumstances are listed in decreasing order of preference; however, this ranking should be the first detail to be discarded when specific circumstances on the beach suggest that a different approach is needed.

A. General Recommendations

Both the published literature and direct experience with cetacean euthanasia make clear that advance preparation will lead to better outcomes. At the national or regional level, such preparation includes:

1. identification of the people, specialized equipment, and the consumable supplies needed;
2. training of responders and those who will perform euthanasia;
3. acquisition of special equipment and supplies, distributed to selected sites, to be held until needed;
4. devising the logistics of moving trained people and the needed supplies to the sites of stranding.

A list of supplies sufficient to euthanize six small cetaceans or one large cetacean includes:

Supplies likely to be available from local sources (but this should be confirmed at each site):

- acepromazine, 50 ml, 10 mg/ml;
- xylazine, 50 ml, 100 mg/ml;
- pentobarbital sodium, 400 ml, 340 mg/ml, or T-61, 800 ml;
- conventional syringes, needles, and intravenous tubing used in farm animal veterinary practice;
- 12 ga shotgun, and slug ammunition;
- rifle and expanding or non-expanding ammunition, .222 Remington, 5.56 x 45 NATO, or 7.62 x 39;
- rifle and expanding or non-expanding ammunition, .308 Winchester, 30-06, or 7.62 x 51 NATO;
- rifle and non-expanding ammunition, .375 or .458;

Supplies not likely to be available from local sources:

- potassium chloride, 5 liters of a 30% solution;
- stainless steel needles designed specifically for cetacean euthanasia, from 30 to 120 cm long.

Sedation and chemical methods of euthanasia require that there be a certainty of control of the carcass until it can be safely disposed of.

Euthanasia by gunshot should be avoided during hours of darkness or whenever the bullet must pass through more than a few centimeters of water.

B. Specific techniques – best practices in decreasing order of preference

i. Small cetaceans

a) One animal: deep sedation by intramuscular injection followed by euthanasia by:

1. intravenous injection of a euthanasia drug; or
2. intracardiac injection of a euthanasia drug; or
3. gunshot to the brain.

b) Small number of animals: all animals to be euthanized should first be sedated by intramuscular injection, then euthanized by:

1. intravenous injection of a euthanasia drug; or
2. intracardiac injection of a euthanasia drug; or
3. simultaneous gunshot to the brain of as many of the selected animals as possible, and the rest in rapid sequence.

c) Large number of animals: do nothing until careful planning has been completed, which has as its purpose the selection of those animals requiring euthanasia and the most rapid simultaneous euthanasia of as many of these animals as possible in the shortest possible time. Sedate each animal by intramuscular injection and mark drugged individuals at the same time. If a gunshot to the brain is the selected option, mark aim point on each animal. If a quick, simple, and gentle method of covering the animals' eyes can be found (e.g., towel), do this for all animals.

Considering the difficulty of finding large amounts of the appropriate drugs on short notice, the best options in decreasing order of preference are:

1. simultaneous gunshot to the brain of as many of the selected animals as possible, and the rest in rapid sequence, while striving to ensure that this process does not cause further stress to those animals that may have a chance for survival; confirm that death has occurred for each animal after all have been shot once; reshoot any animal not dead from the first shot; or
2. intravenous injection of a euthanasia drug; or
3. intracardiac injection of a euthanasia drug; or
4. protected natural death with palliative care for those animals which may not be reached in time for euthanasia.

ii Large cetaceans

a) On shore: deep sedation by intramuscular injection followed by euthanasia by:

   1. intracardiac injection of a euthanasia drug or KCl or both; or
   2. explosives; or
   3. protected natural death with palliative care.

b) In water: deep sedation by intramuscular injection followed by protected natural death with palliative care.

Sources of Uncertainty

Considering the wide variety of species of small and large cetaceans, and the remarkably large size of some of these cetaceans, it is not possible to design strict rules applicable to all species and all circumstances. Daoust and Ortenburger (2015) provide specific recommendations for some of the more common species found in Canadian waters, but more information is needed before these recommendations can be extrapolated directly to other species.

CONCLUSIONS AND ADVICE

The most appropriate choices for euthanasia of cetaceans consist of physical (ballistics) and chemical (drugs) methods. Although the public may favor chemical methods as they imitate what is normally seen when domestic animals are euthanized, these methods have some important disadvantages, such as environmental contamination, inherent logistical difficulties in performing the necessary tasks, and the cost of some of the drugs used. By comparison, physical methods generally tend to be more accessible and more immediately successful, despite an inherently more unpleasant aesthetic dimension.

Considering the wide variety of species of small and large cetaceans, much remains to be learned about the most humane and effective species-specific methods of euthanizing these animals. Moreover, each incident involving the prospect for euthanasia carries its own set of unique circumstances that defy prediction. Therefore, it is not the intent of Daoust and Ortenburger (2015) to derive rigid rules of procedures from their recommendations. However, they do provide advice that can guide individuals responsible for decisions in cases where euthanasia is required.

SOURCES OF INFORMATION

This Science Advisory Report is from the Euthanasia techniques for Cetaceans teleconferences held on June 23 and 26, 2014. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

CCAC: Canadian Council on Animal Care. 2010. CCAC Guidelines on: euthanasia of animals used in science.

Daoust, P.-Y., Ortenburger, A. 2015. Advice on Euthanasia Techniques for Small and Large Cetaceans. DFO Can. Sci. Advis. Sec. Res. Doc. 2014/111. v + 36 p.

APPENDIX A: SUMMARY OF RECOMMENDATIONS FOR THE EUTHANASIA OF CETACEANS

(Daoust and Ortenburger 2015)

Size[1] and Number	Gunshot (minimum caliber)	Explosives	Chemical	Protected natural death with palliative care	Likelihood of success	Problems	Comment
one small cetacean	#2-[2] .222 for porpoise, dolphin; .308 for pilot whale; .375 for minke whale	NR[3]	#1- xylazine, 30 minutes, then intravenous or intracardiac pentobarbital	not appropriate	High		chemical methods preferred
few small cetaceans	#2- simultaneous shooting recommended	NR	#1- sedate all animals first, then euthanize in sequence	not appropriate	High	difficult to prevent live animals from seeing death of others or hearing gunfire	chemical methods preferred
many small cetaceans	#1- simultaneous shooting recommended	NR	deep sedation of most animals may be possible	may be unavoidable	moderate	significant ecotoxicity may result with chemical methods	viable individuals must be rescued prior to euthanasia of terminal cases
one large cetacean	#2- only with training and appropriate equipment (e.g., .458 or .50 BMG)	#4- only with training and appropriate charges	#1- requires training, special needles, and large quantities of euthanasia drugs	#3✔[4]	moderate	significant ecotoxicity may result with chemical methods	gunshot possible in whales up to 12 m long; requires minimum muzzle energy of 4600 ft-lbs
few large cetaceans	NR	NR	#1- requires training, special needles, and large quantities of euthanasia drugs	#2✔	Low	significant ecotoxicity may result with chemical methods	human safety may be a consideration with chemical method
sperm whale	NR	NR	NR	#1✔	not available	considered the most difficult species to euthanize	chemical methods may be possible; efficacy of shooting has rarely been shown

[1] Small cetaceans are defined as less than 6 m long, large cetaceans as more than 6 m long.

[2] **#1-#4**: ranking of methods for most likely circumstances, in decreasing order of preference.

[3] NR: not recommended due to potential for inhumane results, low success, or poor public perception.

[4] ✔- recommended at the present time, although euthanasia may be possible where expertise and equipment permit.

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